UTILIZATION OF NATIONAL WEATHER SERVICE GIS DATA

Thanks for having me!

Nathan Heinert
Meteorologist/GIS Focal Point
NWS Bismarck, ND

National Weather Service-Bismarck

Weather Forecast Offices (122)

Mission Statement…

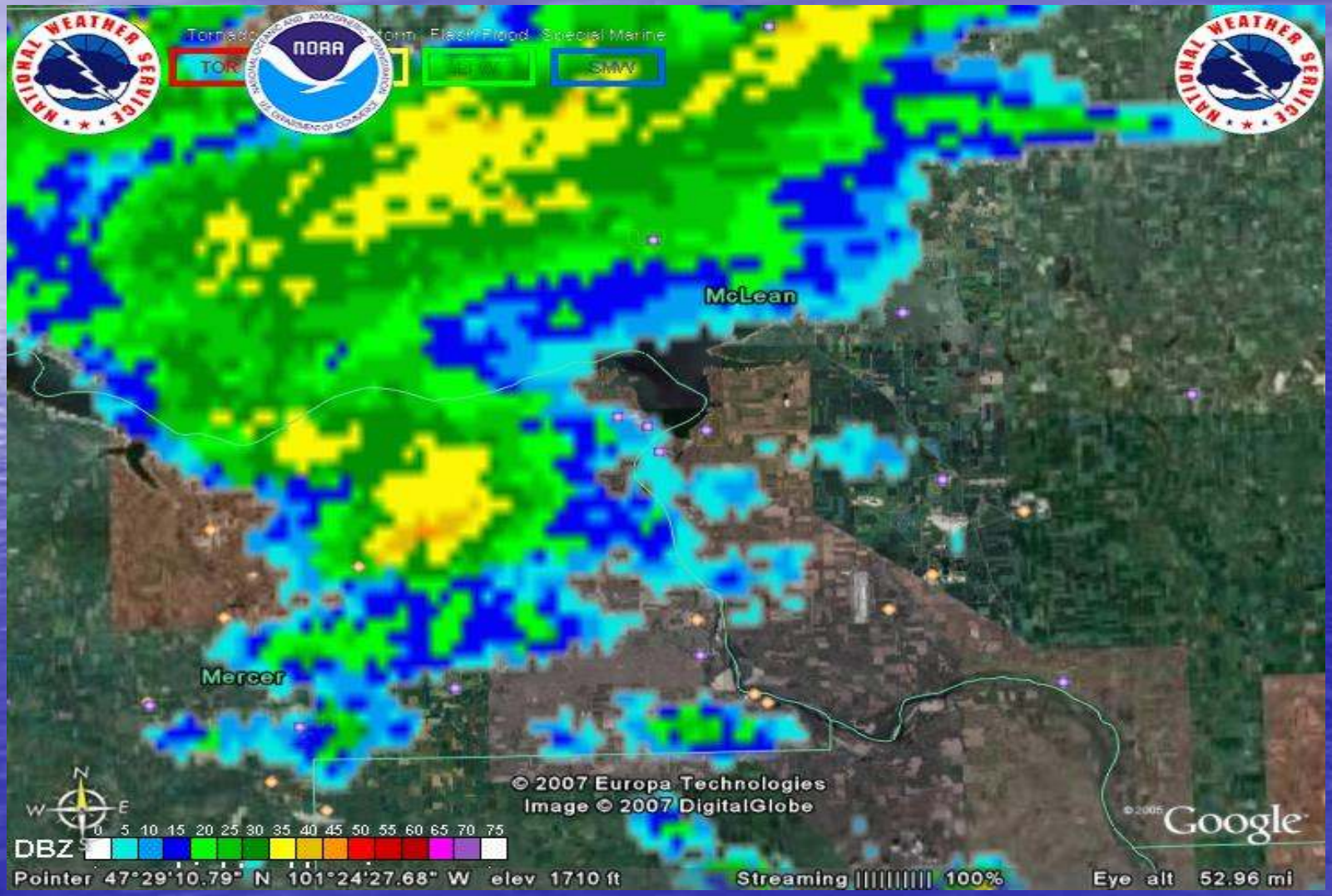
The National Weather Service provides weather, hydrologic, and climate forecasts and warnings for the protection of life and property.

- Open 24 hours a day….365 days a year
- Daily forecasts
  - Includes 7-day forecast, aviation, fire weather, etc…
- High Impact Weather Events

Winter Severe Weather

Summer Severe Weather

Weather Related GIS Datasets



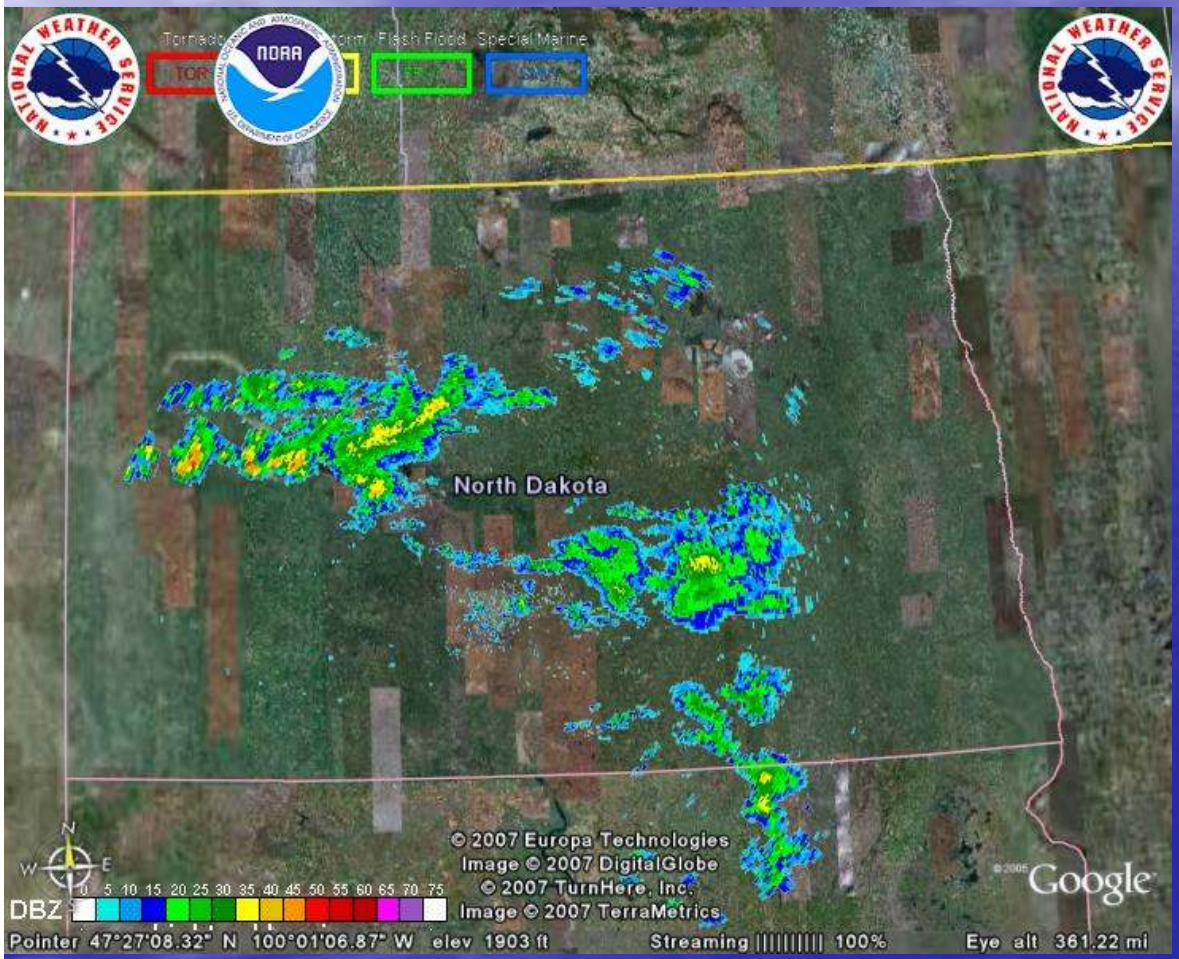
Weather Related GIS Datasets

- Weather related GIS datasets are created daily by the National Weather Service and other state and federal agencies
  - COOP, NDAWN, DOT, APRS and ASOS surface weather reports (to name the majority)
- Hydrology GIS datasets also created daily
  - USGS River data, rainfall and snowfall reports, moisture content of snowpack, etc…
- Plethora of static maps exist as well

Weather Related GIS Datasets (cont)

- Certain GIS datasets are created exclusively by the National Weather Service
  - Doppler Radar Imagery
  - NDFD gridded data
  - Storm data (winter and summer severe weather)
- Let's Focus on these more!!

RIDGE enhanced views of Doppler Radar Imagery (Radar Integrated Display with Geospatial Elements)

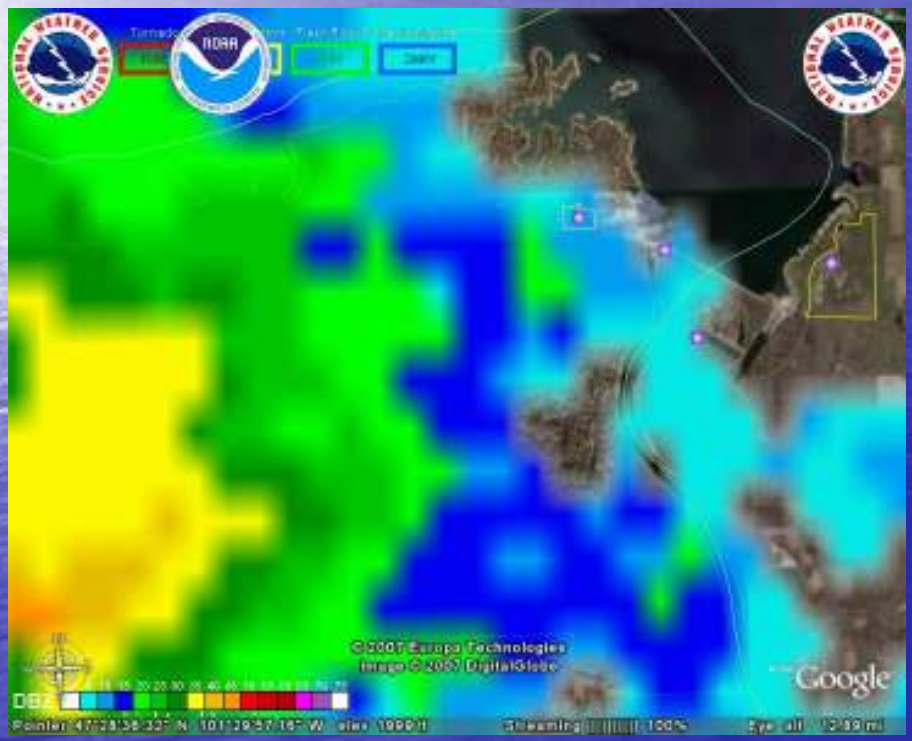


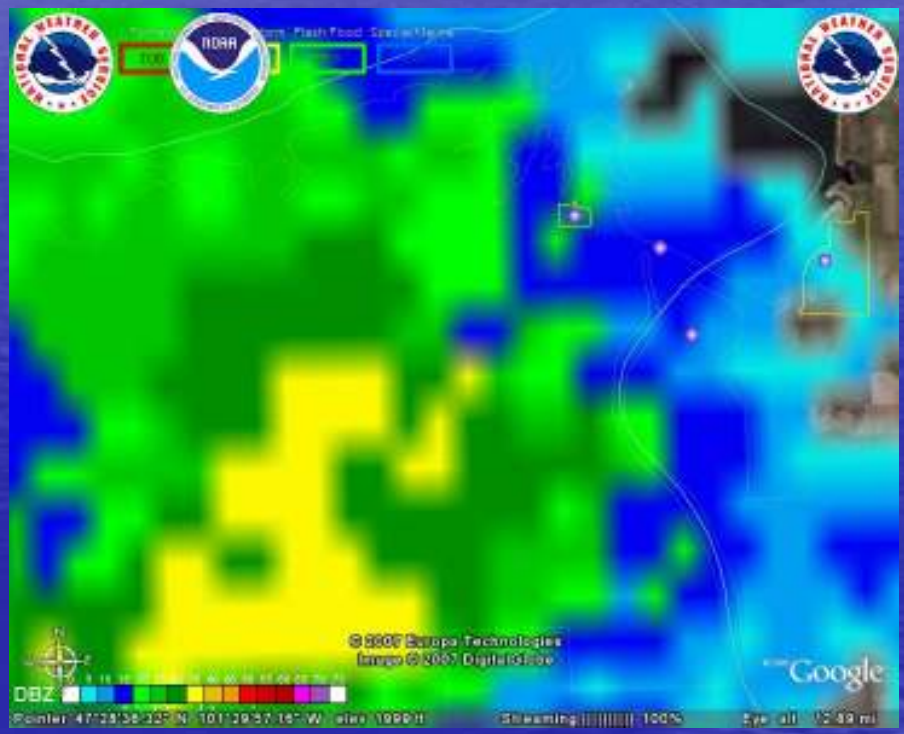
- Each RIDGE radar image created without backgrounds
- Standard geographic projection
- Can import with GIS software and layer to geospatial elements
- File formats include KMZ/KML and gif (with attached world file)

Google Earth Example using KMZ files

Automatically update as new RIDGE images are created via KML/KMZ files.

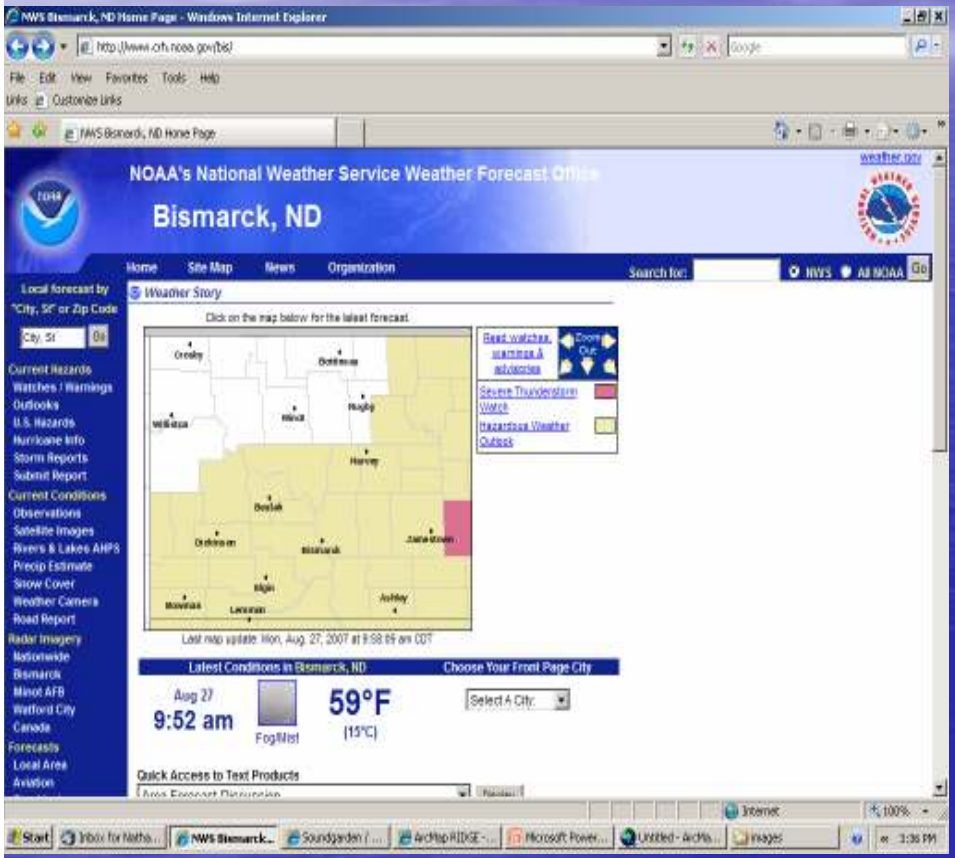
Newer versions of Google Earth support looping of data.

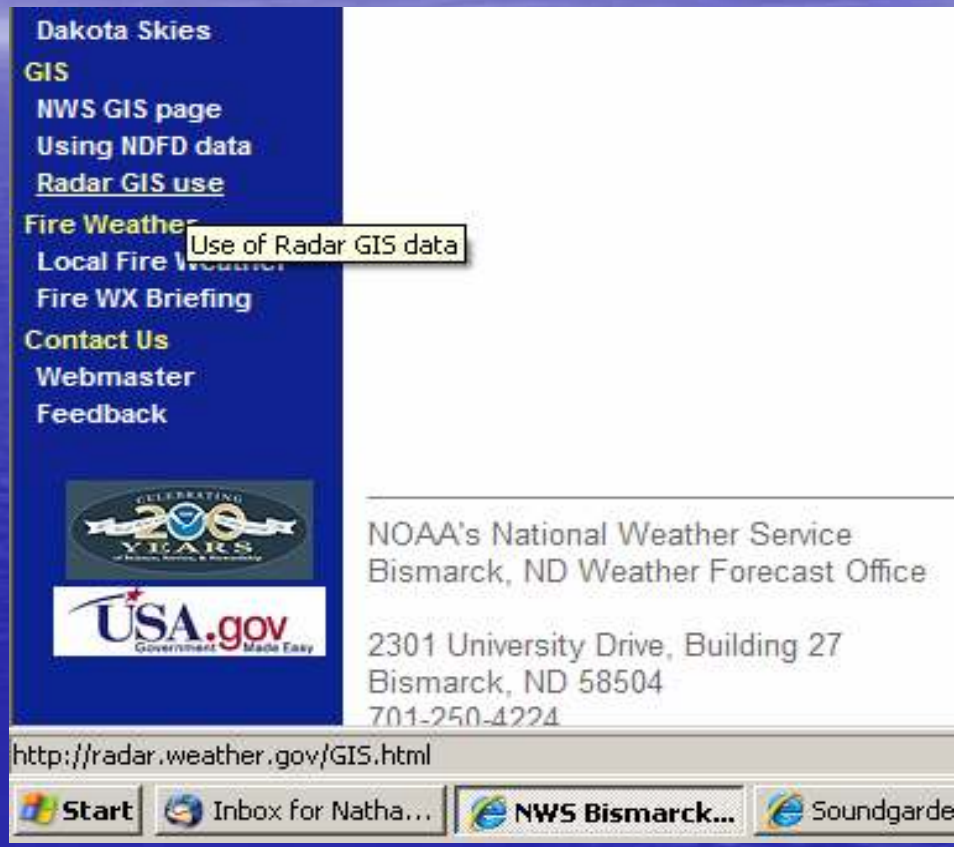




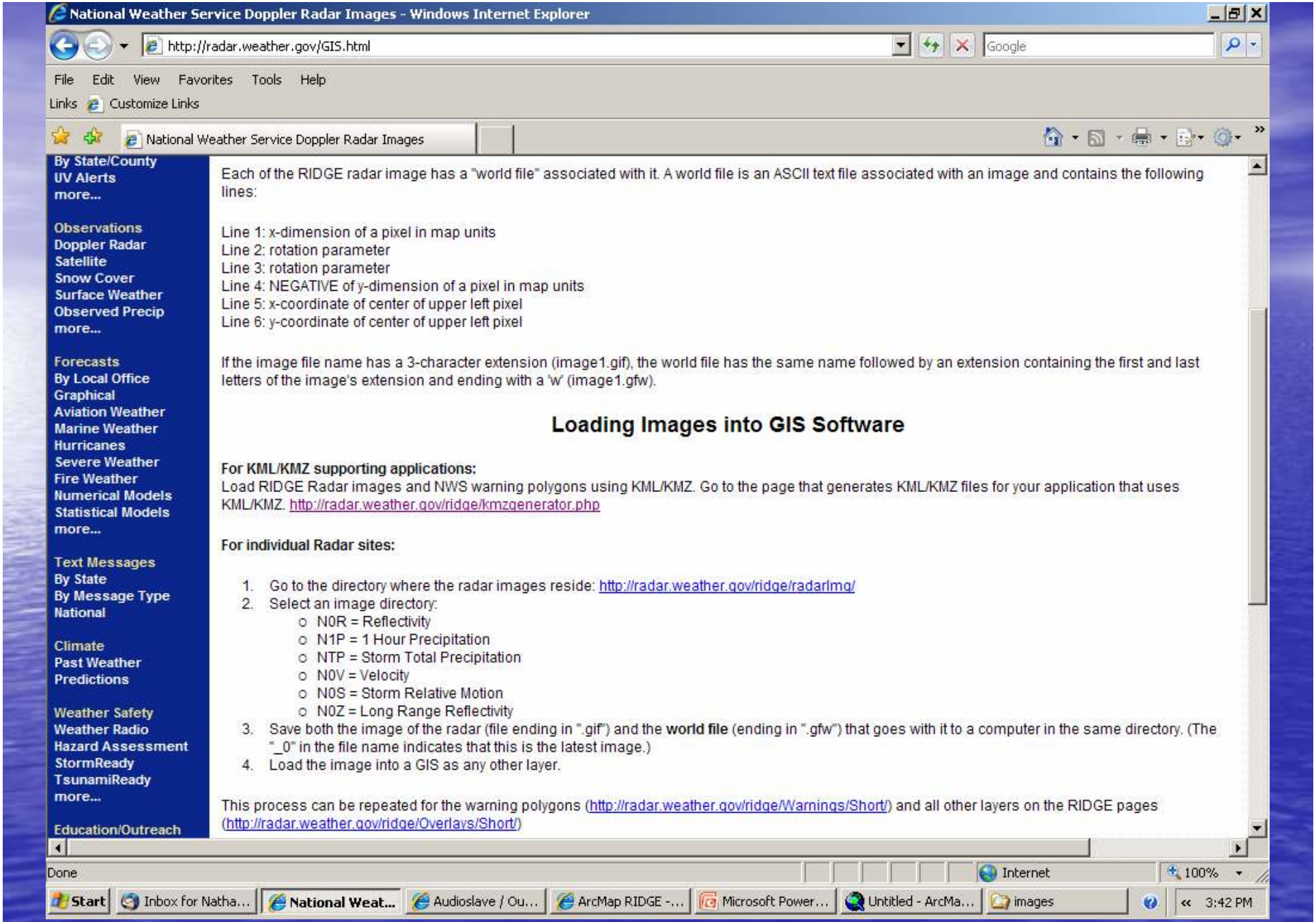
Google Earth Example….(cont.)

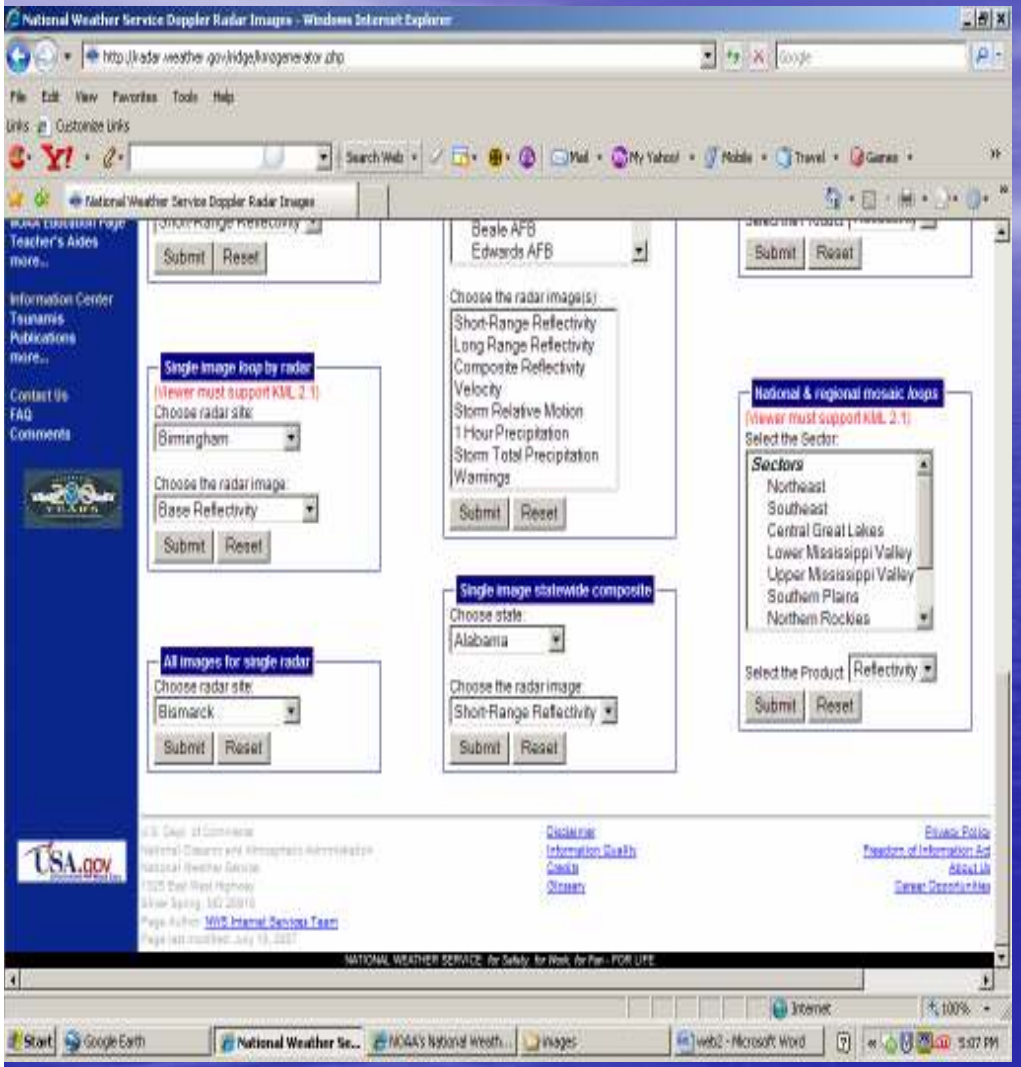
How to get RIDGE datasets…





www.weather.gov/bis

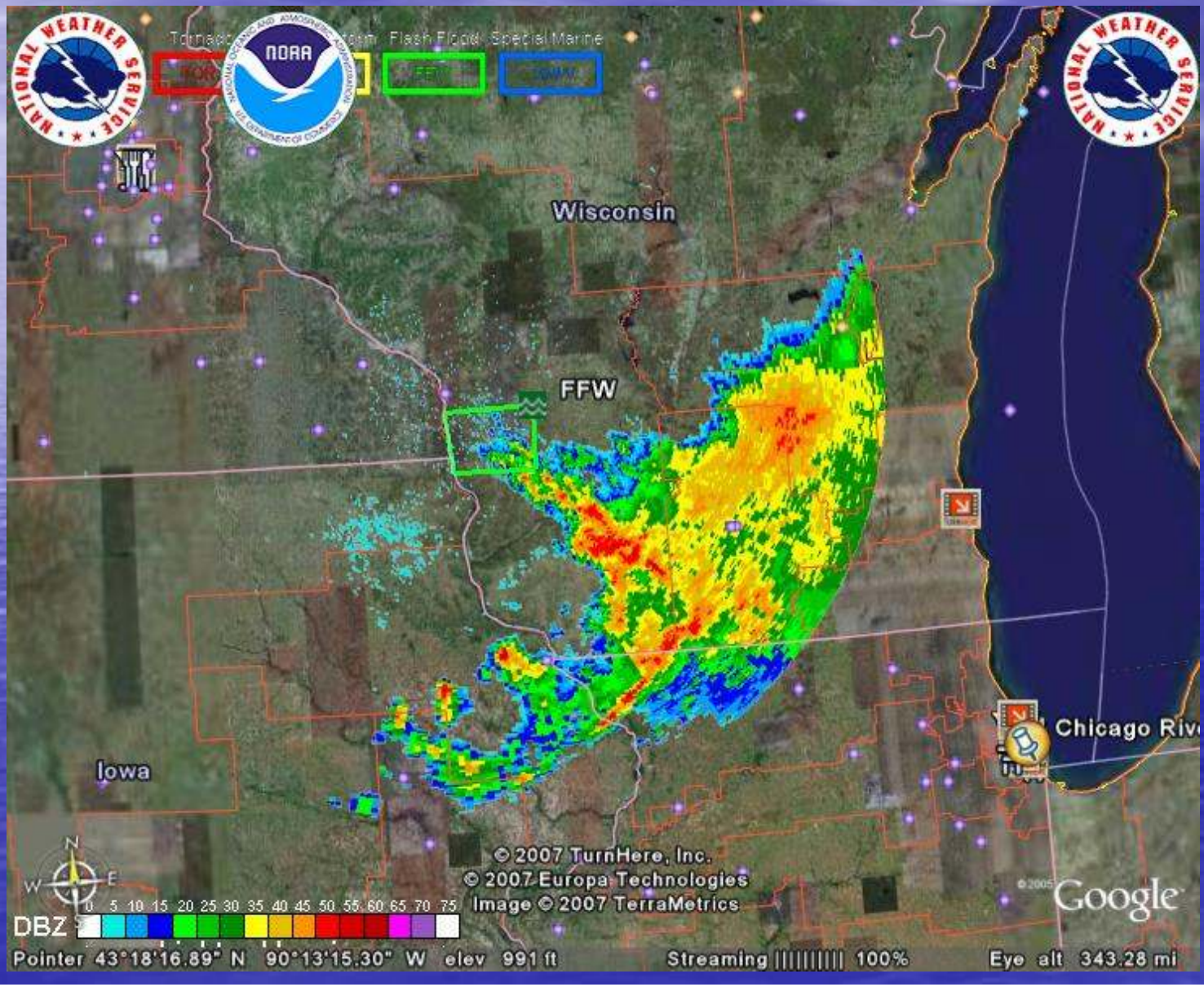

National Weather Service Doppler Radar Images - Windows Internet Explorer
http://radar.weather.gov/GIS.html
Google
File Edit View Favorites Tools Help
Links Customize Links
National Weather Service Doppler Radar Images
By State/County
UV Alerts
more...
Observations
Doppler Radar
Satellite
Snow Cover
Surface Weather
Observed Precip
more...
Forecasts
By Local Office
Graphical
Aviation Weather
Marine Weather
Hurricanes
Severe Weather
Fire Weather
Numerical Models
Statistical Models
more...
Text Messages
By State
By Message Type
National
Climate
Past Weather
Predictions
Weather Safety
Weather Radio
Hazard Assessment
StormReady
TsunamiReady
more...
Education/Outreach
Each of the RIDGE radar image has a "world file" associated with it. A world file is an ASCII text file associated with an image and contains the following lines:
Line 1: x-dimension of a pixel in map units
Line 2: rotation parameter
Line 3: rotation parameter
Line 4: NEGATIVE of y-dimension of a pixel in map units
Line 5: x-coordinate of center of upper left pixel
Line 6: y-coordinate of center of upper left pixel
If the image file name has a 3-character extension (image1.gif), the world file has the same name followed by an extension containing the first and last letters of the image's extension and ending with a 'w' (image1.gfw).
Loading Images into GIS Software
For KML/KMZ supporting applications:
Load RIDGE Radar images and NWS warning polygons using KML/KMZ. Go to the page that generates KML/KMZ files for your application that uses KML/KMZ. http://radar.weather.gov/ridge/kmzgenerator.php
For individual Radar sites:
1. Go to the directory where the radar images reside: http://radar.weather.gov/ridge/radarImg/
2. Select an image directory:
o N0R = Reflectivity
o N1P = 1 Hour Precipitation
o NTP = Storm Total Precipitation
o N0V = Velocity
o N0S = Storm Relative Motion
o N0Z = Long Range Reflectivity
3. Save both the image of the radar (file ending in ".gif") and the world file (ending in ".gfw") that goes with it to a computer in the same directory. (The "_0" in the file name indicates that this is the latest image.)
4. Load the image into a GIS as any other layer.
This process can be repeated for the warning polygons (http://radar.weather.gov/ridge/Warnings/Short/) and all other layers on the RIDGE pages (http://radar.weather.gov/ridge/Overlays/Short/)
Done
Internet
100%
Start
Inbox for Natha...
National Weat...
Audioslave / Ou...
ArcMap RIDGE -...
Microsoft Power...
Untitled - ArcMa...
images
3:42 PM



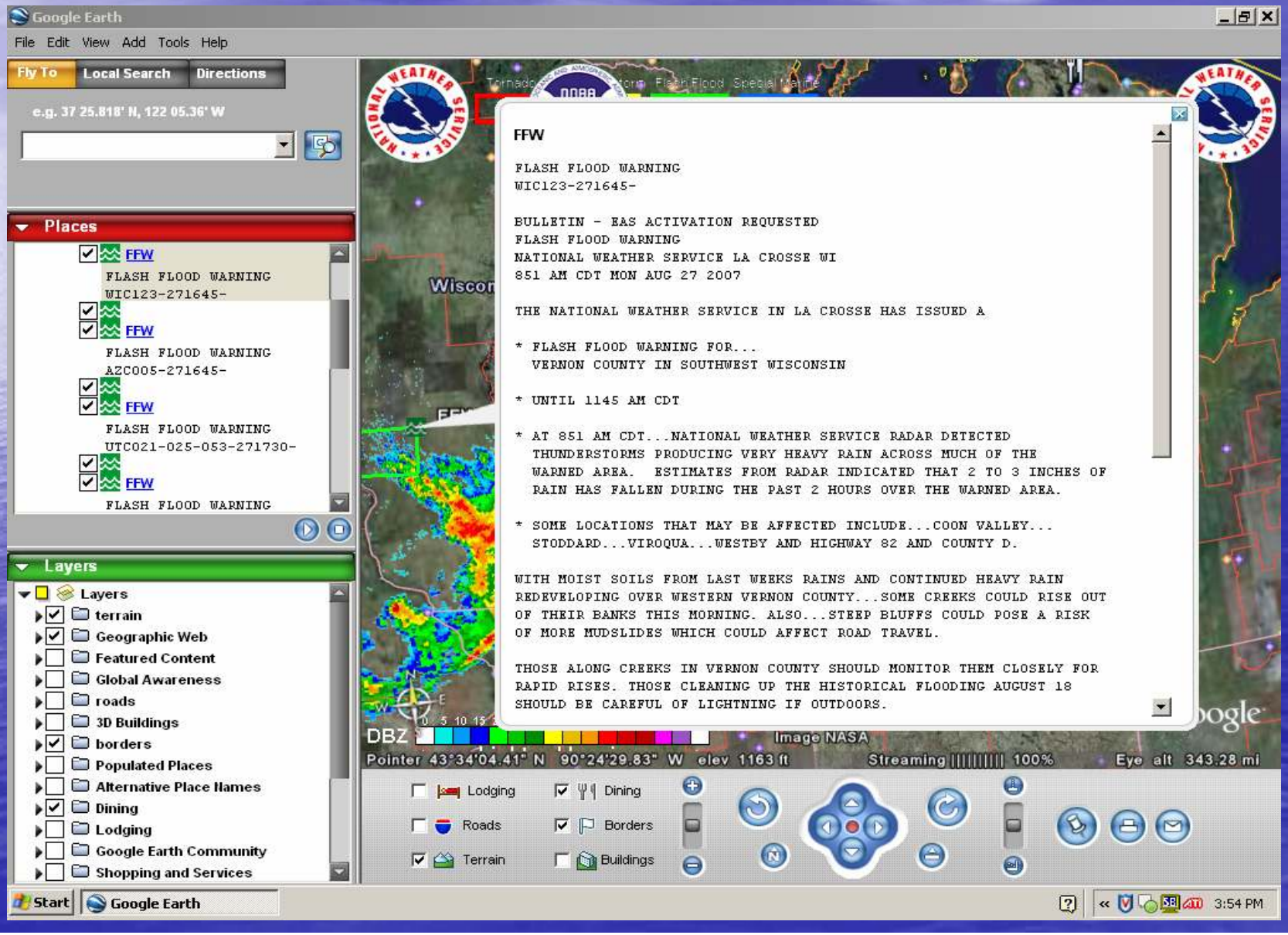
- Local or Regional radar imagery
  - Reflectivity
  - Velocity
  - Precipitation Estimates
  - Etc…
- Warning Box + text

http://radar.weather.gov/ridge/kmzgenerator.php

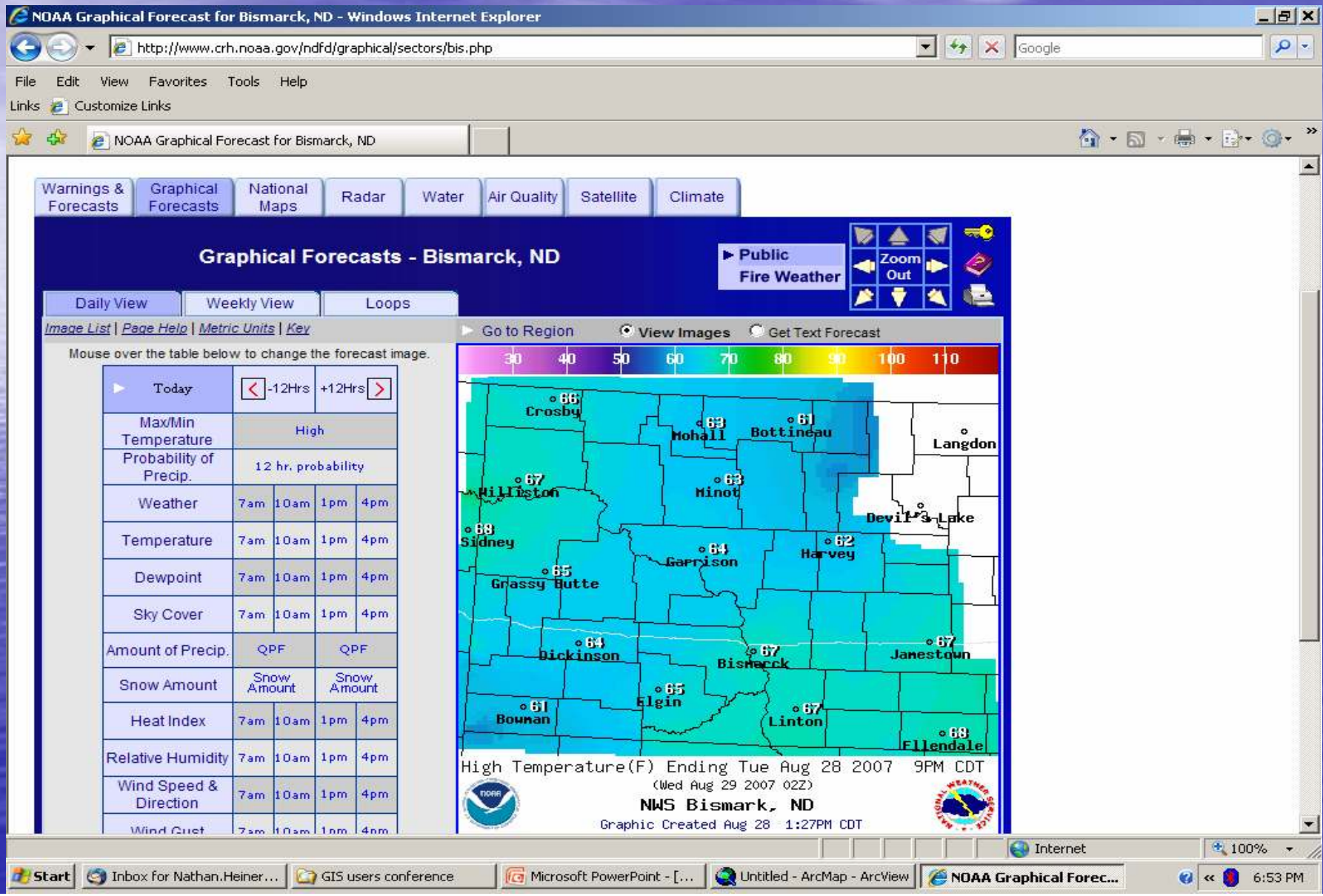
Example…


Tornado
Flash Flood
Special Marine
NOAA
Wisconsin
FFW
Iowa
Chicago Riv
© 2007 TurnHere, Inc.
© 2007 Europa Technologies
Image © 2007 TerraMetrics
Google
DBZ
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
Pointer 43°18'16.89" N 90°13'15.30" W elev 991 ft
Streaming 100%
Eye alt 343.28 mi

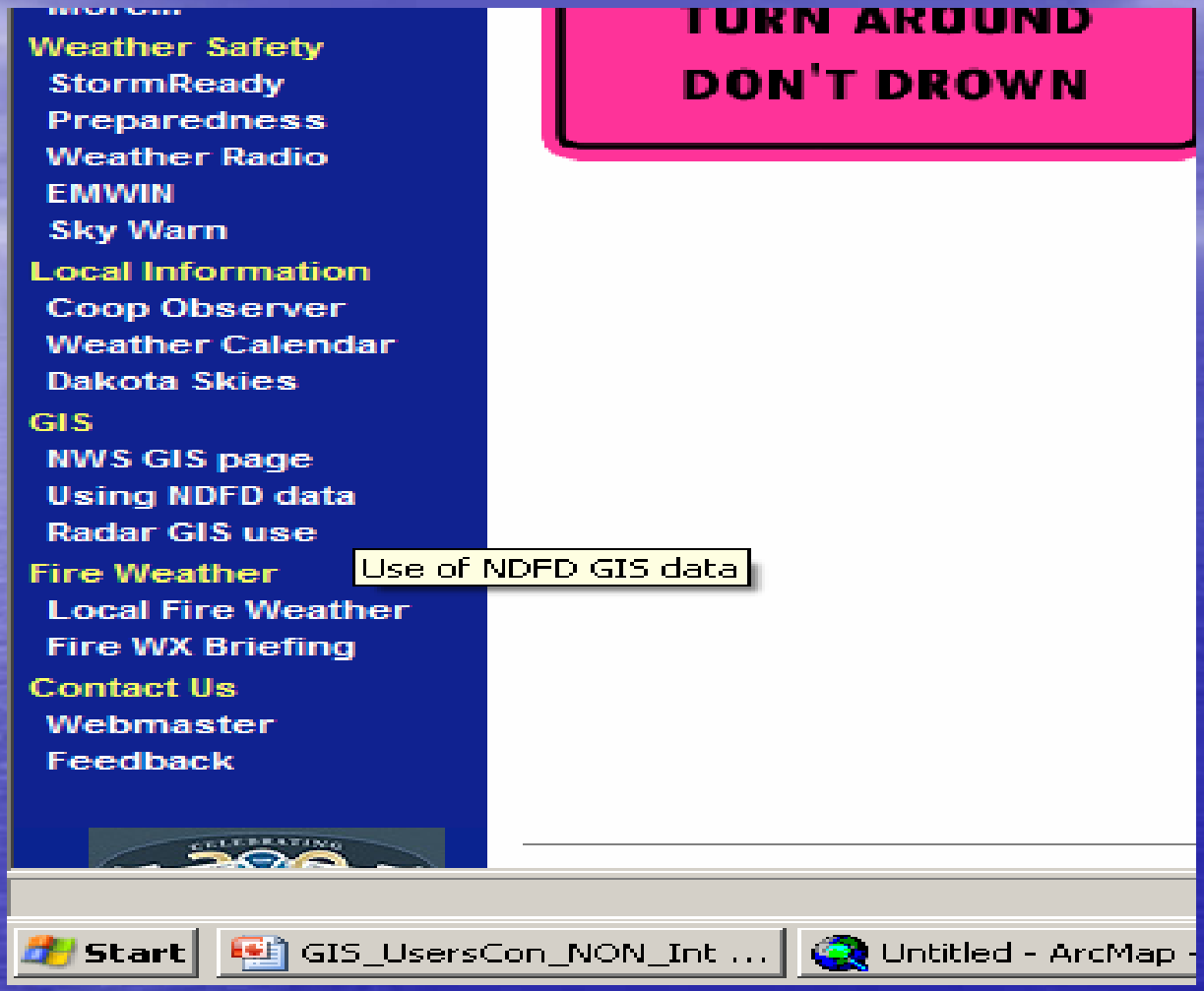
Example…(cont.)



NDFD (National Digital Forecast Database) gridded data



How to download NDFD gridded data into shapefile format



http://www.weather.gov/ndfd/gis/ndfd_GIS_tutorial.html

http://www.weather.gov/ndfd/gis/ndfd_tutorial.pdf

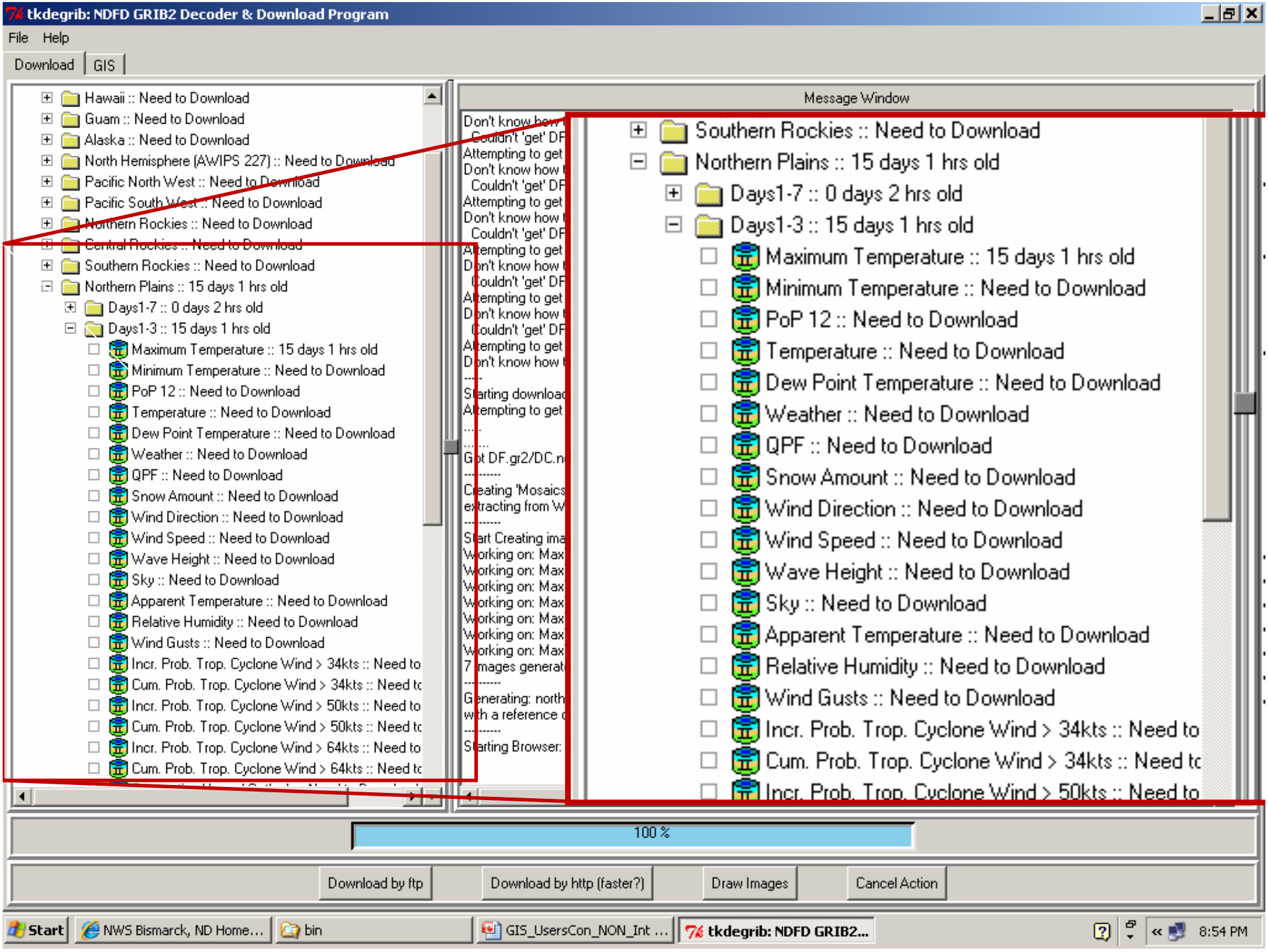
Tutorial: Using NDFD gridded data in a GIS Environment (Shapefiles and Floating Point Grids)

Why bring NDFD grids into a GIS?

One of the most attractive components of the National Digital Forecast Database is the geospatial nature of the data. The database is based on a 5km national grid that covers the Continental U.S. and separate grids that cover Hawaii, Alaska, the U.S. Virgin Islands, and Puerto Rico. Each 5km grid cell has forecast information so that a point specific forecast can be generated for any cell based on geographic coordinate location. Besides being able to just view the grids using algorithms to create graphics of the gridded information, more advanced users may want to perform analysis with gridded data to answer some real-world problems. Bringing the NDFD gridded files into a GIS enables the user to not only display the forecast elements with other georectified datasets such as satellite imagery, aerial photographs, and planimetric layers such as political boundaries, road networks, buildings, etc..., but also to query the data and use it for geospatial analysis. The result is essentially a real-time and forecast decision support tool for making critical decisions based on various weather elements. This is the case for marine interests as well, as the NDFD grid extend offshore several miles and deliver wave and wind information. Using the NDFD data in a GIS gives the flexibility to deal with either Raster versions of the NDFD grids (floating point grids), or vector versions (ESRI shapefiles) as well as other formats that are just recently becoming importable into GIS like NetCDF files and GRADS. The best way to illustrate the power of using NDFD grids in a GIS can best be presented via a use case scenario given below.

Using NDFD grids for pre-Hurricane landfall decision making

During the 2004 hurricane season NDFD forecast elements were used to display experimental forecast elements such as wind speed, wave heights, and quantitative precipitation forecasts along with hurricane forecast tracks in a map format that was used by DHS/FEMA for risk analysis at the FEMA Region IV Regional Operation Center and Disaster Field Office. For hurricanes Charley, Frances, Ivan, and Jeanne maps were created showing NDFD forecast elements overlaid on relevant political boundaries, roads, shoreline, and major population centers. The elements gave DHD/FEMA risk analysts an idea of the spatial coverage and intensity of forecast winds and wave heights. These maps were used to create the Presidential Briefing Package in which DHS/FEMA briefs the executive branch on potential damages that will be incurred from the approaching storm so as to pre-secure federal resources for response and aid through a presidential disaster declaration. This is an example of how having the NDFD grids converted to GIS significantly benefited the decision making process for weather driven natural disasters such as hurricanes. See Figure 1 and 2 below.


tkdegrib: NDFD GRIB2 Decoder & Download Program
File
Help
Download
GIS
Hawaii :: Need to Download
Guam :: Need to Download
Alaska :: Need to Download
North Hemisphere (AWIPS 227) :: Need to Download
Pacific North West :: Need to Download
Pacific South West :: Need to Download
Northern Rockies :: Need to Download
Central Rockies :: Need to Download
Southern Rockies :: Need to Download
Northern Plains :: 15 days 1 hrs old
Days1-7 :: 0 days 2 hrs old
Days1-3 :: 15 days 1 hrs old
Maximum Temperature :: 15 days 1 hrs old
Minimum Temperature :: Need to Download
PoP 12 :: Need to Download
Temperature :: Need to Download
Dew Point Temperature :: Need to Download
Weather :: Need to Download
QPF :: Need to Download
Snow Amount :: Need to Download
Wind Direction :: Need to Download
Wind Speed :: Need to Download
Wave Height :: Need to Download
Sky :: Need to Download
Apparent Temperature :: Need to Download
Relative Humidity :: Need to Download
Wind Gusts :: Need to Download
Incr. Prob. Trop. Cyclone Wind > 34kts :: Need to
Cum. Prob. Trop. Cyclone Wind > 34kts :: Need to
Incr. Prob. Trop. Cyclone Wind > 50kts :: Need to
Cum. Prob. Trop. Cyclone Wind > 50kts :: Need to
Incr. Prob. Trop. Cyclone Wind > 64kts :: Need to
Cum. Prob. Trop. Cyclone Wind > 64kts :: Need to
Message Window
Southern Rockies :: Need to Download
Northern Plains :: 15 days 1 hrs old
Days1-7 :: 0 days 2 hrs old
Days1-3 :: 15 days 1 hrs old
Maximum Temperature :: 15 days 1 hrs old
Minimum Temperature :: Need to Download
PoP 12 :: Need to Download
Temperature :: Need to Download
Dew Point Temperature :: Need to Download
Weather :: Need to Download
QPF :: Need to Download
Snow Amount :: Need to Download
Wind Direction :: Need to Download
Wind Speed :: Need to Download
Wave Height :: Need to Download
Sky :: Need to Download
Apparent Temperature :: Need to Download
Relative Humidity :: Need to Download
Wind Gusts :: Need to Download
Incr. Prob. Trop. Cyclone Wind > 34kts :: Need to
Cum. Prob. Trop. Cyclone Wind > 34kts :: Need to
Incr. Prob. Trop. Cyclone Wind > 50kts :: Need to
100 %
Download by ftp
Download by http (faster?)
Draw Images
Cancel Action
Start
NWS Bismarck, ND Home...
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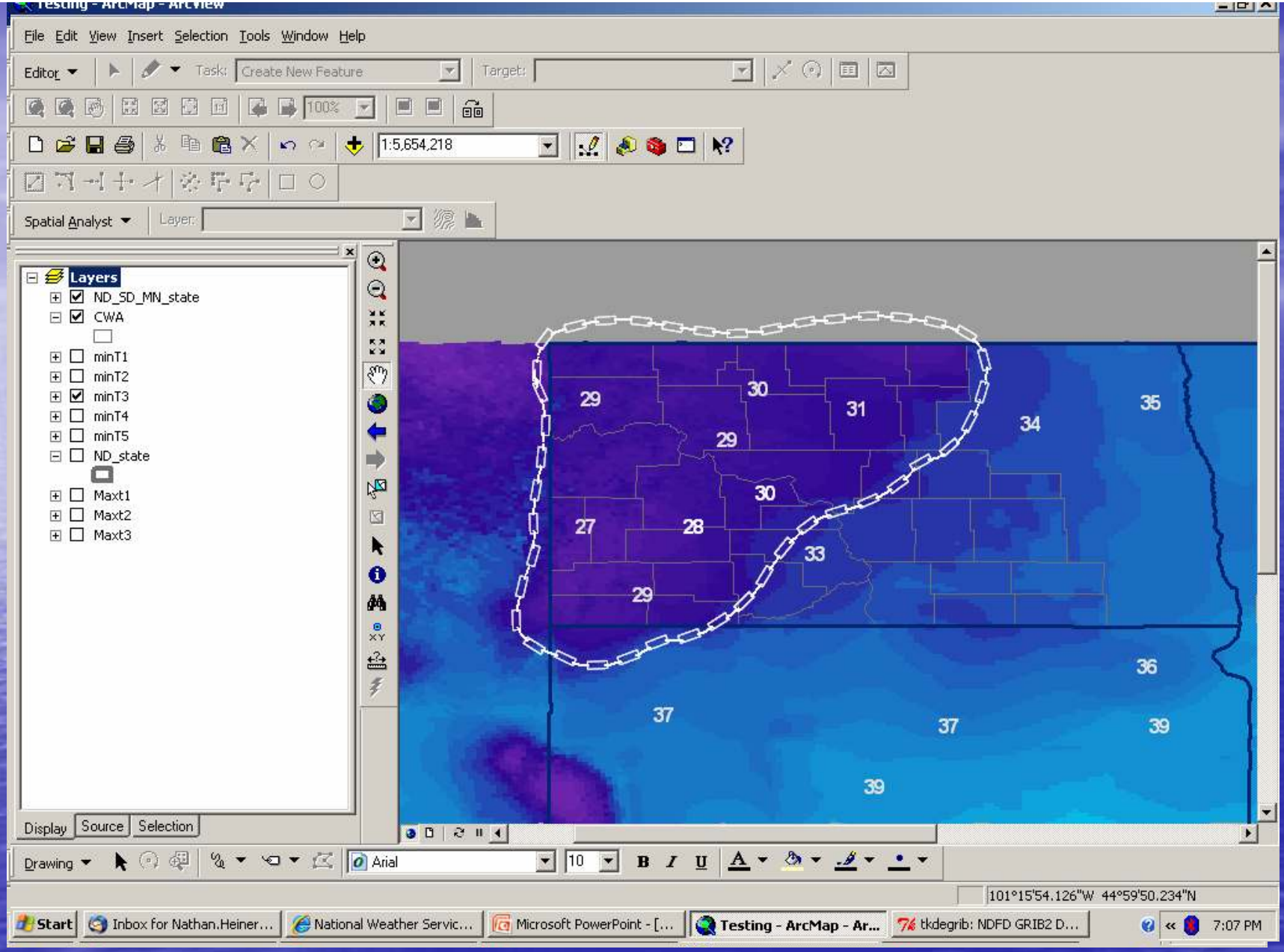
tkdegrib: NDFD GRIB2...
8:54 PM



This process can also be automated via command line

Other NDFD Links

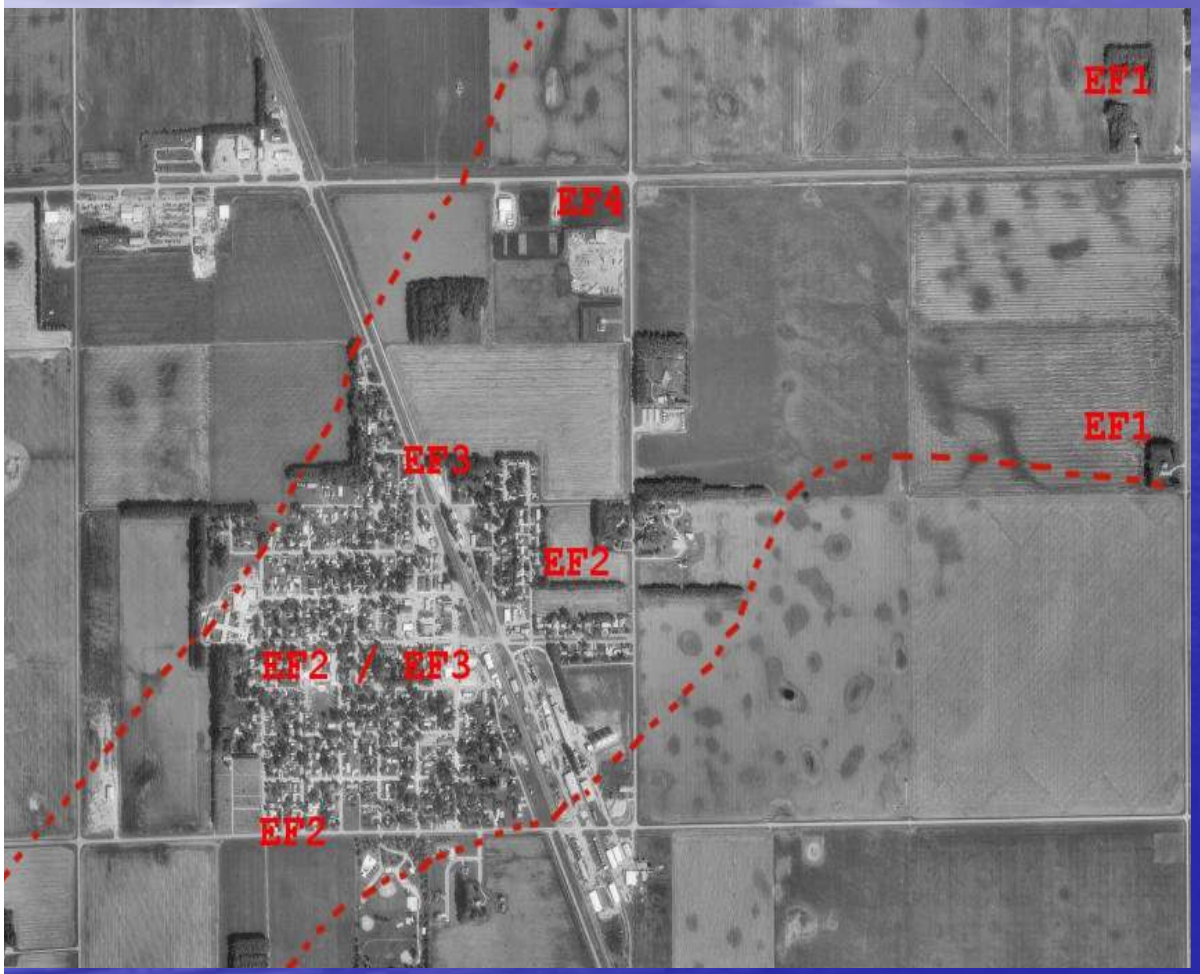
www.weather.gov/ndfd/briefings/NDFDWkshp_CSC_GISandNDFD_final.ppt

http://www.prh.noaa.gov/regsci/gis/shapefiles/ndfd/

- To Download the deGRIB GUI

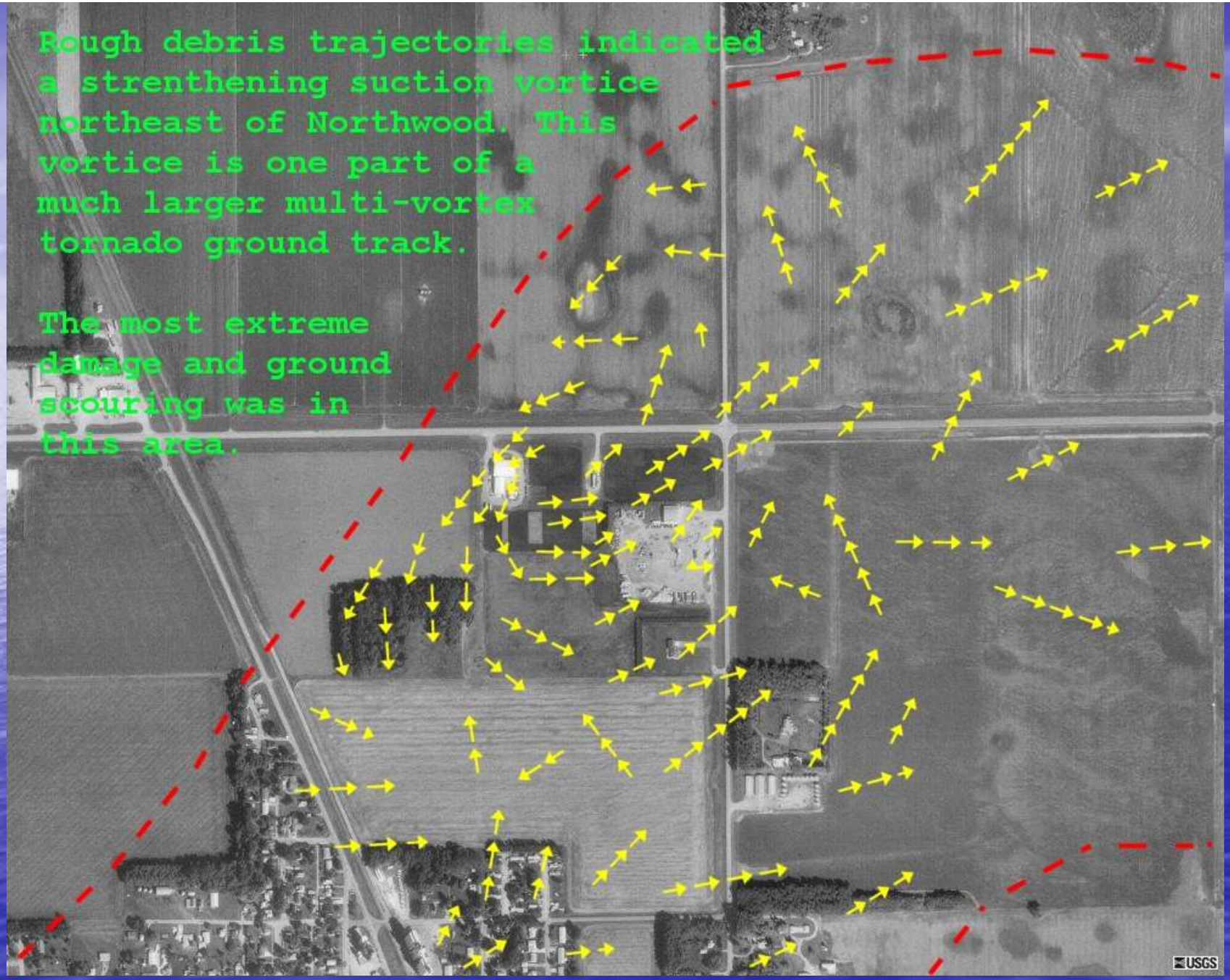
http://www.weather.gov/mdl/NDFD_GRIB2Decoder/download.php

Summer and Winter Storm Data



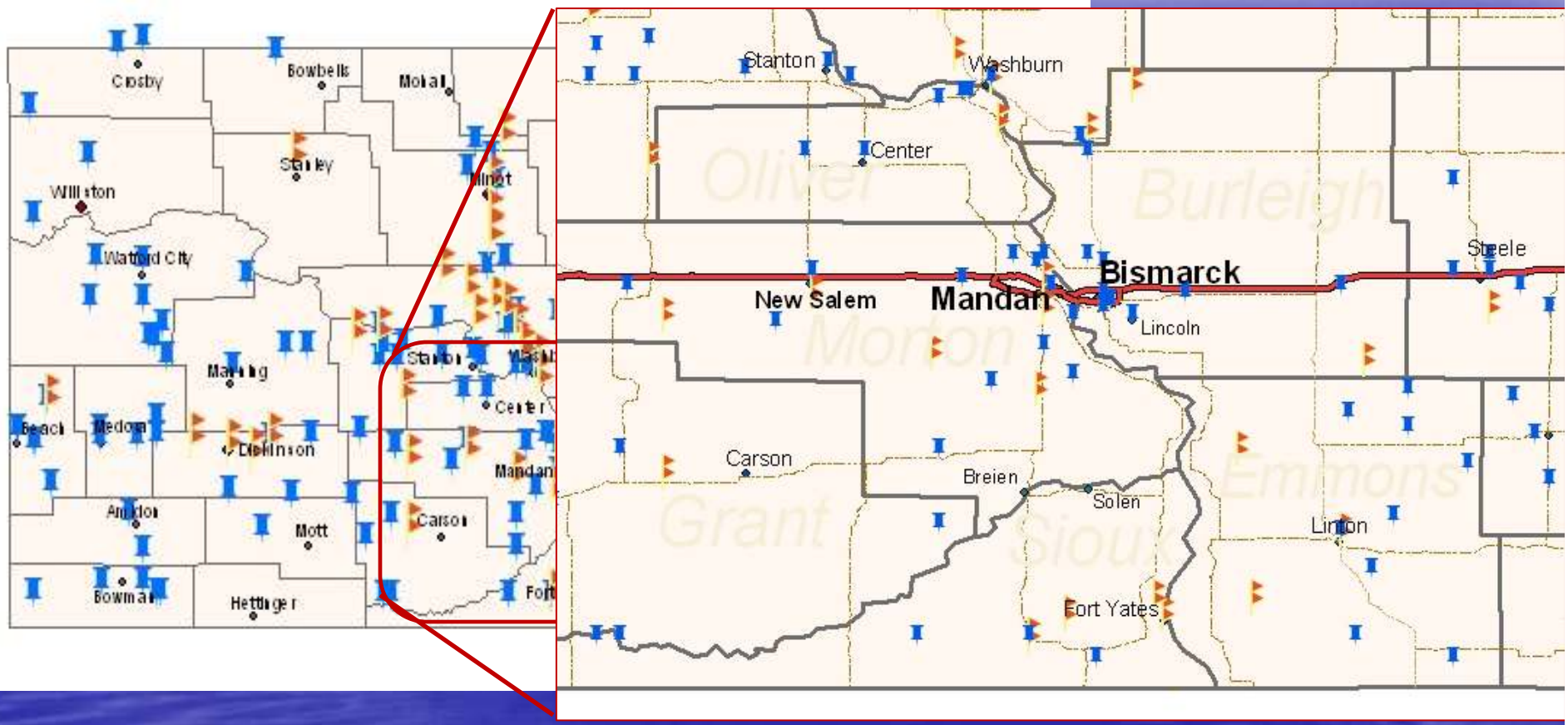
- Northwood tornado damage assessment
- Utilization of GPS and aerial photography in storm surveys

Courtesy of the Grand Forks National Weather Service Office

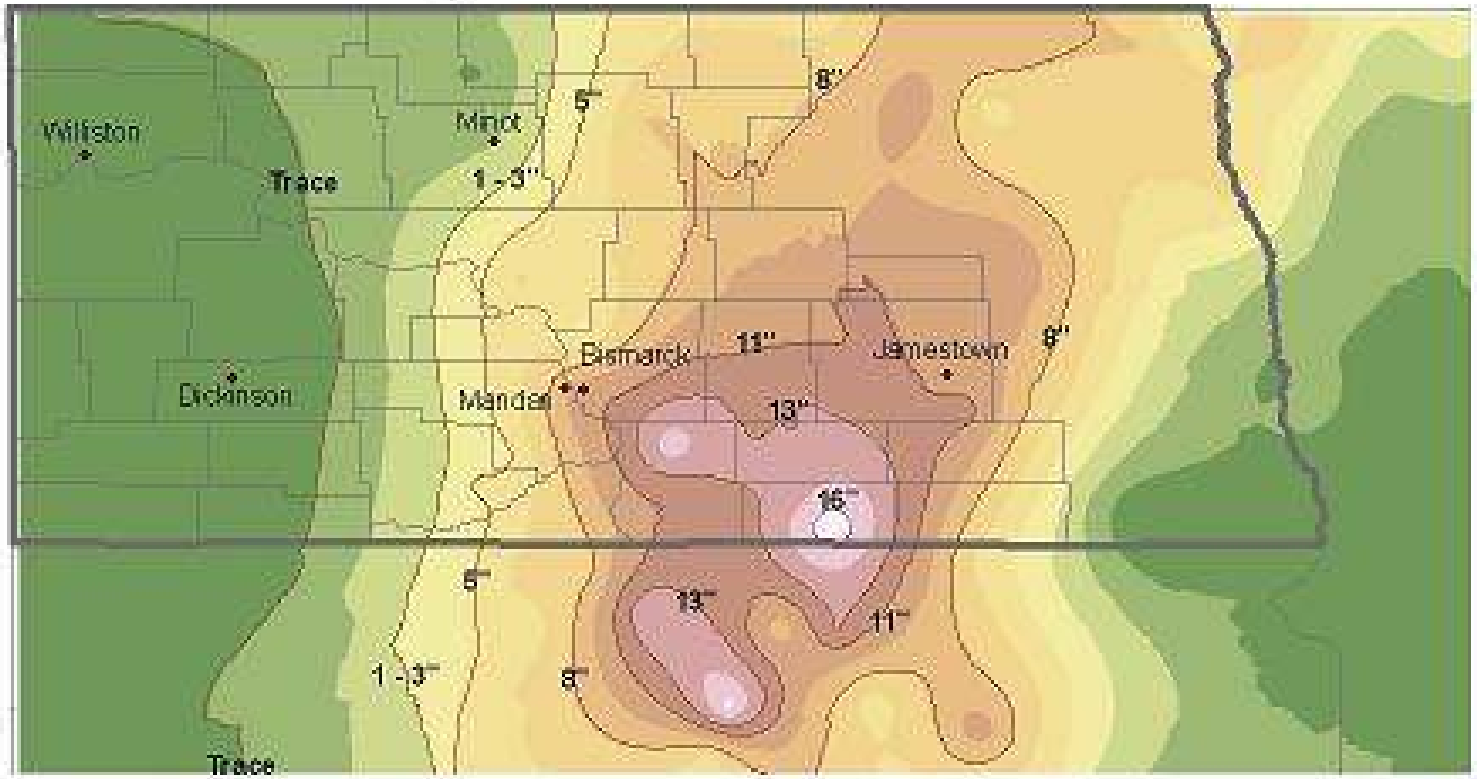


Courtesy of the Grand Forks National Weather Service Office

Severe Hail and Thunderstorm wind reports



Total Storm Snowfall Amounts
Saturday December 30th - 2006



The End…

Come and visit us sometime!!

Any Questions?

nathan.heinert@noaa.gov

701-250-4224